

A Liquid-Liquid Thermoelectric Heat Exchanger as a Heat Pump for Testing Phase Change Material Heat Exchangers

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ABSTRACT

The primary objective of the Phase Change HX payload on the International Space Station (ISS) is to test and demonstrate the viability and performance of Phase Change Material Heat Exchangers (PCM HX). The system was required to pump a working fluid through a PCM HX to promote the phase change material to freeze and thaw as expected on Orion's Multipurpose Crew Vehicle. Due to limitations on ISS's Internal Thermal Control System, a heat pump was needed on the Phase Change HX payload to help with reducing the working fluid's temperature to below 0°C (32°F). This paper will review the design and development of a TEC based liquid-liquid heat exchanger as a way to vary to fluid temperature for the freeze and thaw phase of the PCM HX. Specifically, the paper will review the design of custom coldplates and sizing for the required heat removal of the HX.